Statistical Characterization of Aviation Risk Factors

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The FAA uses risk indicators (RIs) and performance metrics (PMs) as part of an inspection program designed to ensure certificate holders associated with aviation domains comply with various federal regulations. RIs and PMs are observable variables that are correlated with the occurrence of specific hazards. An untoward pattern in RIs and PMs is an indication that the probability of a hazard realization has increased to an unsatisfactory level.

Continuous improvement in the scope, precision and relevance of RIs and PMs is a permanent objective of the FAA. In April 2002, we began working on a methodology for defining RIs and PMs associated with a given hazard. The first phase of our work was to survey how other industries define and mange risk. In the current phase of our research, we are formulating an objective and semi-automatic methodology for producing candidate RIs and PMs. We believe this can be achieved by applying text-analysis methods to historical accounts of hazard realizations. In such a process, we would first extract commonly occurring keywords and phrases from a sample of reports describing realizations of the hazard. Next, we group the most frequently occurring keywords and phrases into synonym groups. Each synonym group is then translated into an appropriate RI or PM by identifying a variable that measures the phenomena that is collectively described by the associated keywords and phrases. A final step in the process is to eliminate any redundant candidate RIs and PMs.

In addition, we are developing techniques for characterizing the statistical behavior of RIs and PMs under typical conditions, and for identifying departures from expected behavior. We anticipate using classic statistical process control methods to monitor trends in the RI and PM values. However, we expect we will need to modify the classic methods to account for inevitable violations of assumptions such as independent observations and Gaussian distributed variables.

Our work is in support of the risk management and decision support strategic plan that was developed by AAR-490. In this talk, we will give an overview of our proposed RI and PM development methodology, and identify what will be involved in the application of the methodology to specific hazards. The scope of our applications is hazards associated with dispatch and flight release, cabin attendant training, continuing analysis and surveillance system (CASS), and training for flight crewmembers. Other teams that are supporting the strategic plan are creating lists of hazards within each of these four areas. To the extent possible, we will show preliminary results of the applications.